In [ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [ ]:
```
data = pd.read_csv("data/USArrests.csv", index_col = 0)
```

In [ ]:
```
data.head(3)
```

Out[ ]:

	Murder	Assault	UrbanPop	Rape
Alabama	13.2	236	58	21.2
Alaska	10.0	263	48	44.5
Arizona	8.1	294	80	31.0

In [ ]:
```
data.tail(3)
```

Out[ ]:

	Murder	Assault	UrbanPop	Rape
West Virginia	5.7	81	39	9.3
Wisconsin	2.6	53	66	10.8
Wyoming	6.8	161	60	15.6

In [ ]:
```
data.info()
```

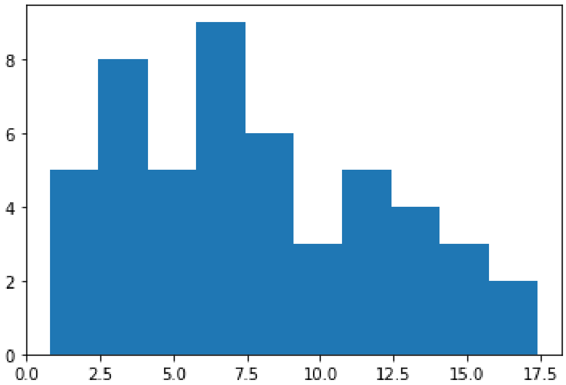
```
<class 'pandas.core.frame.DataFrame'>
Index: 50 entries, Alabama to Wyoming
Data columns (total 4 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   Murder    50 non-null     float64
 1   Assault   50 non-null     int64  
 2   UrbanPop  50 non-null     int64  
 3   Rape      50 non-null     float64
dtypes: float64(2), int64(2)
memory usage: 2.0+ KB
```

In [ ]:
```
data.describe()
```

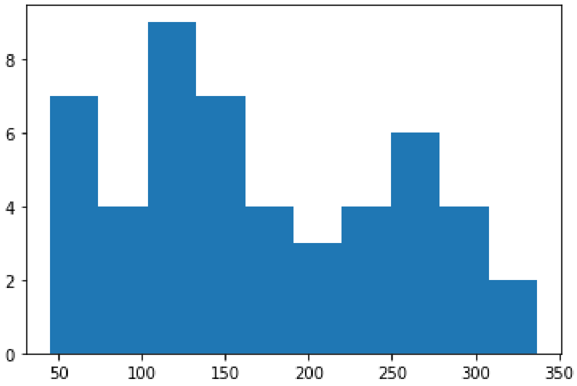
Out[ ]:

	Murder	Assault	UrbanPop	Rape
count	50.00000	50.000000	50.000000	50.000000
mean	7.78800	170.760000	65.540000	21.232000
std	4.35551	83.337661	14.474763	9.366385
min	0.80000	45.000000	32.000000	7.300000
25%	4.07500	109.000000	54.500000	15.075000
50%	7.25000	159.000000	66.000000	20.100000
75%	11.25000	249.000000	77.750000	26.175000
max	17.40000	337.000000	91.000000	46.000000

In [ ]:
```
plt.hist(data['Murder'])
plt.show()
```

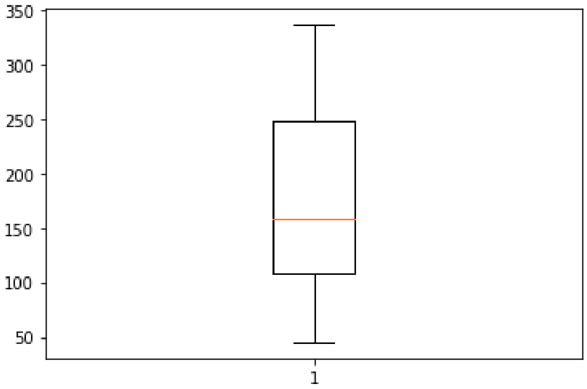


In [ ]:
```
plt.hist(data['Assault'])
plt.show()
```



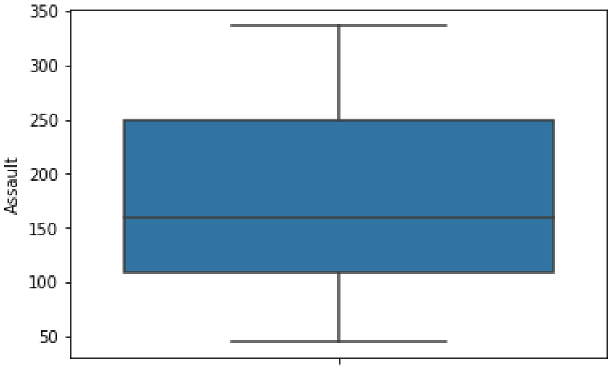
In [ ]:

```
plt.boxplot(data['Assault'])
plt.show()
```



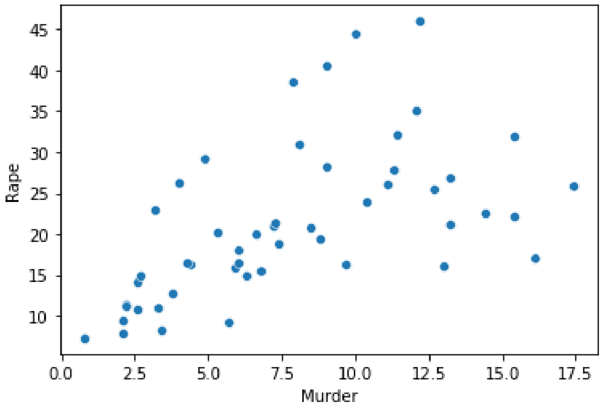
In [ ]:

```
sns.boxplot(y = data['Assault'])
plt.show()
```



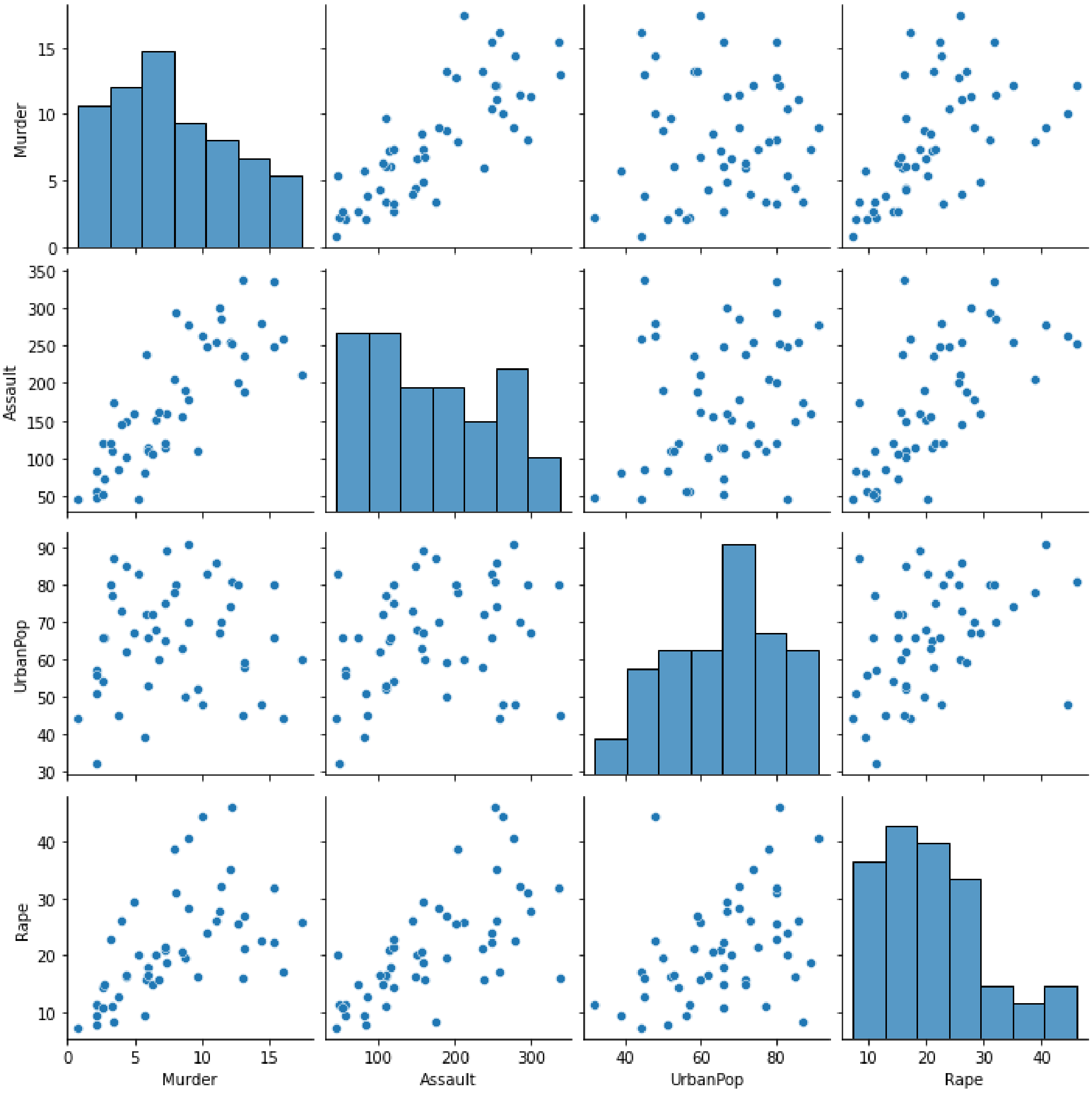
In [ ]:

```
sns.scatterplot(x = "Murder", y = "Rape", data = data)
plt.show()
```



In [ ]:

```
sns.pairplot(data)
plt.show()
```



In [ ]:
```
data.isna().sum()
```

Out[ ]:
```
Murder      0
Assault     0
UrbanPop    0
Rape        0
dtype: int64
```

In [ ]:
```
x = data
```

In [ ]:
```
from sklearn.cluster import KMeans
```

In [ ]:
```
kmean_inst = KMeans(n_clusters=6)
```

In [ ]:
```
kmean_inst.fit(x)
```

Out[ ]:
```
▾        KMeans
KMeans(n_clusters=6)
```

In [ ]:
```
kmean_inst.inertia_
```

Out[ ]:
```
18768.000666666667
```

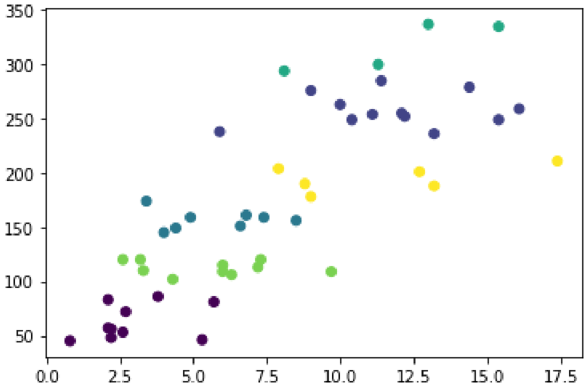
In [ ]:
```
kmean_inst.cluster_centers_
```

Out[ ]:
```
array([[  2.95      ,  62.7       ,  53.9       ,  11.51      ],
       [ 11.76666667, 257.91666667,  68.41666667,  28.93333333],
       [  5.75      , 156.75      ,  74.        ,  19.4       ],
       [ 11.95      , 316.5       ,  68.        ,  26.7       ],
       [  5.59      , 112.4       ,  65.6       ,  17.27      ],
       [ 11.5       , 195.33333333,  66.16666667,  27.43333333]])
```

In [ ]:
```
kmean_inst.labels_
```

```
Out[ ]: array([1, 1, 3, 5, 1, 5, 4, 1, 3, 5, 0, 4, 1, 4, 0, 4, 4, 1, 0, 3, 2, 1,
               0, 1, 5, 4, 4, 1, 0, 2, 1, 1, 3, 0, 4, 2, 2, 4, 2, 1, 0, 5, 5, 4,
               0, 2, 2, 0, 0, 2], dtype=int32)
```

```
In [ ]: plt.scatter(data['Murder'], data['Assault'], c = kmean_inst.labels_)
        plt.show()
```



```
In [ ]: from sklearn.preprocessing import StandardScaler
```

```
In [ ]: km_labels = kmean_inst.labels_
```

```
In [ ]: data['km_clus_label'] = km_labels
```

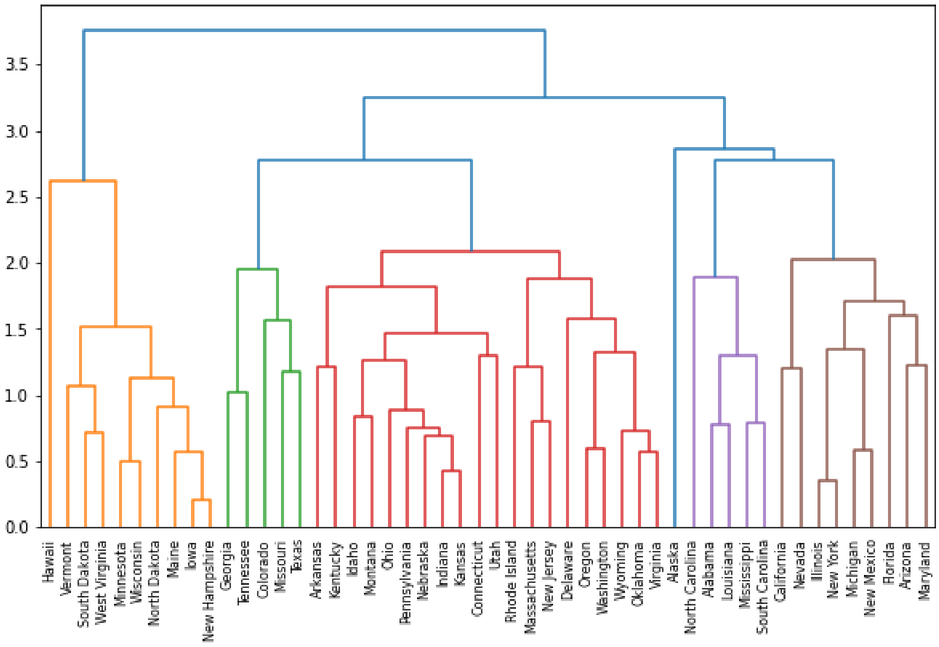
```
In [ ]: # data
```

```
In [ ]: sc = StandardScaler()
        x = sc.fit_transform(data)
```

```
In [ ]: from scipy.cluster.hierarchy import linkage
        from scipy.cluster.hierarchy import dendrogram
```

```
In [ ]: mergings = linkage(x , method = "average")
```

```
In [ ]: plt.figure(figsize=(10,6))
        dendrogram(mergings, labels = data.index)
        plt.show()
```



```
In [ ]:
```